

Conventional and organic alternatives to methyl bromide on California strawberries.

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Fifth year field experimentation with alternative soil fumigants and various non-chemical soil amendments for strawberry production on the Central California Coast have yielded repeated trends with alternative plug plants and fumigants common to studies in 1995, 1996, 1997 and 1998. These previous results have been reported at MBAO annual meetings, and have been published in the literature or are in current manuscript form by these authors. 1999 season results are discussed as follows:

1. Site description: Current experimentation is being conducted at two Central California locations with differing soil types and planted to the same cultivars. They are designated as Carpenter Canyon and Edna Valley. The Carpenter Canyon site is a loamy sand previously in pasture for 20 years, which was planted to Camerosa plug and bare root plants in the fall of 1998 for certified organic production in the spring of 1999. The Edna Valley site has clay soil and was planted to cover crops the winter and spring of 1999, followed by lettuce according to a Coastal Cropping Systems project with organic, biorational and conventional production methods. It is planted in strawberries for fall 1999 in comparisons of plug and bare root transplants.
2. Alternative chemical fumigation. In previous years, several chemical fumigants were tested in comparison to methyl bromide/chloropicrin for performance under field conditions. Following fumigation, the highly disease susceptible UC cultivar Camerosa was planted and growth and yield parameters recorded. Across all years, the best performing fumigant was Telone/Chloropicrin at 30-35% chloropicrin. These results were consistent for both loam and clay soils among the years. In addition to Telone/chloropicrin, data for metham sodium in clay indicated relatively good control of soil diseases, but not in sandy loam. By contrast, performance of Telone/chloropicrin was not impacted by soil type and yields were only 5-8% less than those of methyl bromide/chloropicrin. Current soil fumigation 1999 studies have included, 1) ozone and combination ozone + *Trichoderma* soil treatments in cooperation with Soilzone, Inc., to control soil diseases and weeds in strawberry and cut flowers, 2) In-season treatments of chemigated Telone for control of grape phylloxera and nematodes in grapes, and 3) Pre-plant drip chemigation of C-35 for control of nematodes and soil diseases of pepper.
3. Organic soil amendments. In 1999, as in all previous year's studies, efforts were made to build the soil foodweb to the extent that the rhizosphere was suppressive to plant pathogenic microorganisms. In earlier years, these organic soil treatments also included *Brassica* residues (shredded broccoli plants), alone and with high rates of compost, and

VAM (Vesicular-arbuscular mycorrhizae) inoculation. Our results with *Brassica* residues in light and heavier soil types show that while pathogenicity of soils are somewhat reduced, a single preplant soil application of shredded *Brassica* even at high rates is not sufficient to maintain roots pathogen free season-long. In plantings so treated, yield was significantly reduced over conventional fumigation with methyl bromide, and usually only slightly better than untreated soil without fumigation or organic amendments. Yield results from utilization of compost for building microbial diversity and a pathogen suppressive soil environment varied depending on the history of the soil prior to planting. In the first year compost studies (1996), soil had no history of conditioning but instead was fallowed three years prior to planting. Here, compost application at high rates with VAM inoculation had beneficial effects on fruit production. Second year results (1997) at this same site, had one year of conditioning prior to planting. These replicated plots were composted and VAM inoculated. Yields in this preconditioned soil differed only 28 flats of fruit per acre from the high yielding methyl bromide standard. Compared to untreated soil, this difference also favored VAM and compost with an average 216 additional flats of fruit per acre. In 1998 however, following two years of preconditioning prior to experimentation, smaller differences occurred from the addition of compost, and almost no benefit on either bare root or plug plants was demonstrated from inoculation with VAM.

Current soil amendment experimentation. A six acre farm was certified organic for the purpose of concentrating on soil amendment regimes and utilization of four seasons of information on alternative strawberry production methods. Plug plants and VAM inoculation were compared to bare root and non inoculated plants on amended soil for two varieties. Camerosa was significantly more affected by soil pathogens and yielded much less than the Catalina cultivar under these non-fumigated conditions. By the end of the season in August, Camerosa was showing foliar symptoms of root infection with visibly reddened and desiccated foliage, and *Verticillium* and *Collitrichium* were easily isolated from decomposing roots. By contrast, the Catalina variety had no visible signs of root disease and roots were white and healthy. Plant size was greater and harvest continued for 6 weeks longer with the Catalina variety compared to Camerosa.

4. Alternative plug plants. The 1999 production season at the Carpenter Canyon ranch involved first year organic production with two primary cultivars, Camarosa and Catalina (proprietary) in both plug and conventional bare root plantings. These researchers produced the plug plants at our research farm in San Luis Obispo, and the first year results from this production were not as good as in 1996-1998 when plug plants were purchased from commercial suppliers. Nevertheless, while yields were only slightly higher than bare root plants of either variety across the entire season, production was significantly earlier than bare rooted plants. If the season had terminated in June as is normal, the plug plants would have clearly out-performed bare rooted types. In this year, the market price differential in early season fruit was significant enough to increase profits well above bare root plants, even after allowance for the markedly higher plant costs associated with strawberry plugs.

5. 1999-2000 season trials. Current season experimentation involves studies at both sites on the central California coast. At the Carpenter Canyon site, the entire planting is comprised of comparison trials of soil amendments and various organic pest controls for foliar diseases and invertebrate pests. The Edna Valley site has a three year CAL-DPR sponsored Coastal Cropping Project that compares conventional, biorational and organic production methods for vegetables and strawberries in a rotational system within the same replicated field areas for three years. Soil food web and crop production methods and yields are being monitored through each successive season.

6. Data are presented from current season's (1998-99) results with alternative strawberry plug plants and various soil amendment treatments.